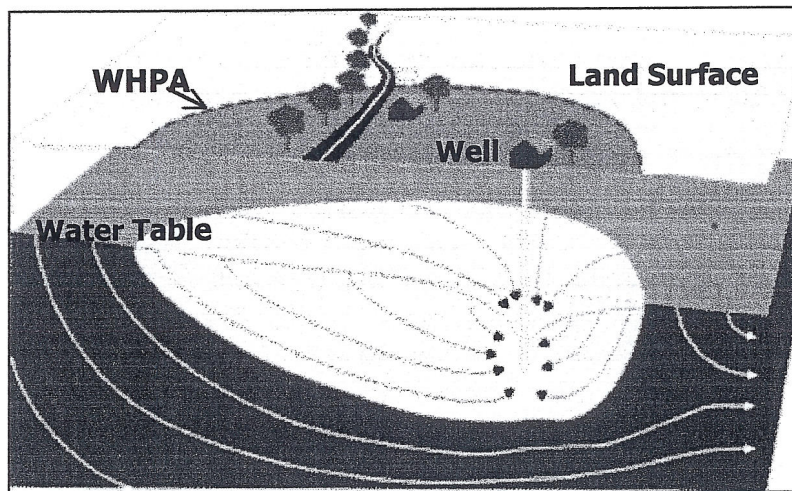


SOURCE WATER ASSESSMENT
FOR THE TOWN OF MOUNT AIRY
CARROLL COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
September 2000



TABLE OF CONTENTS

	Page
Summary	1
Introduction.....	2
Well Information.....	2
Table 1. Mount Airy Well Information	
Hydrogeology.....	2
Source Water Assessment Area Delineation	3
Potential Sources of Contamination.....	3
Table 2. Potential Contaminant Point Sources within the Mount Airy WHPA	
Table 3. Land Use Summary for the Mount Airy WHPA	
Table 4. Sewer Service Area Summary for the Mount Airy WHPA	
Water Quality Data	6
Table 5a. IOC results above 50% of the MCL for Mount Airy Plant 1 (Wells 1-4) finished water since 1993	
Table 5b. IOC results above 50% of the MCL for Mount Airy Plant 2 (Wells 5 and 6) finished water since 1993	
Table 5c. IOC results above 50% of the MCL for Mount Airy Plant 3 (Well 7) finished water since 1993	
Table 6a. Tetrachloroethene results for Well Nos. 5 & 6 combined since 1990.	
Table 6b. Tetrachloroethene results for Well No. 5 since 1989	
Table 7. Radon-222 results above 50% of the proposed MCL for Mount Airy Plant 1 (Wells 1 – 4) and Plant 3 (Well 7) finished Water since 1993	
Susceptibility Analysis	10
Management of the WHPA.....	12
References.....	14
Other Sources of Data.....	15

SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the Town of Mount Airy. The required components of this report as described in Maryland's Source Water Assessment Plan (SWAP) are: 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The source of Mount Airy's water supply is an unconfined fractured rock aquifer. The system uses seven wells and one standby well to obtain its drinking water. The Source Water Assessment Area was delineated by the Carroll County Bureau of Water Resources Management and the WSP using U.S. EPA approved methods specifically designed for each source.

Potential sources of contamination within the assessment area were identified based on site visits, database reviews and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and potential contaminant sources within the Source Water Assessment Area and an aerial photograph of the well locations are enclosed at the end of the report.

The susceptibility analysis for Mount Airy's water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well integrity. It was determined that Mount Airy's water supply is susceptible to contamination by nitrates, volatile organic compounds (except for Well No. 8), synthetic organic compounds, radionuclides and is not susceptible to protozoans. Two of the wells (Nos. 2 and 7) are susceptible to bacteria and viruses.

INTRODUCTION

The Town of Mount Airy is located 18 miles east of Frederick City in the southwest corner of Carroll County and southeast Frederick County (figure 1). Mount Airy's water system is owned and operated by the Town and serves a population of about 5400. Currently, the water is supplied by seven wells with one well (No.3) being used as a standby well (figure 1).

WELL INFORMATION

A review of well data and sanitary surveys of Mount Airy's water system indicates that Well Nos. 1 and 5 were drilled prior to the implementation of the State's well construction regulations in 1973. Well Nos. 2, 3 and 4 were reconstructed in the late 1980s. Well Nos. 6, 7 and 8 were drilled in 1987, 1990 and 1991, respectively in accordance with the well construction standards. Table 1 contains a summary of the well construction data.

SOURCE ID	SOURCE NAME	PERMIT	TOTAL DEPTH	CASING DEPTH	AQUIFER
01	Mount Airy 1	N/A	87	34	Ijamsville Fm-Marsburg Schist
02	Mount Airy 2	FR73280	260	23	Ijamsville Fm-Marsburg Schist
03	Mount Airy 3	FR880068	140	N/A	Ijamsville Fm-Marsburg Schist
04	Mount Airy 4	FR810090	180	62	Ijamsville Fm-Marsburg Schist
05	Mount Airy 5	CL680340	420	52	Ijamsville Fm-Marsburg Schist
06	Mount Airy 6	CL815072	260	82	Ijamsville Fm-Marsburg Schist
07	Twin Ridge 7	FR881825	182	43	Ijamsville Fm-Marsburg Schist
09	Summit Ridge 8	FR881971	240	28	Ijamsville Fm-Marsburg Schist

Table 1. Mount Airy Well Information.

The wells have pumping rates between 100 gallons per minute (gpm) and 210 gpm. The water pumped out of Well Nos. 1 through 4 is treated at Plant 1. Well Nos. 5 and 6 get their water treated at Plant 2. Well No. 7 and 8 have their own treatment plants on site (Plants 3 and 4).

HYDROGEOLOGY

The Town of Mount Airy is located on top of a geologic structure known as the Parrs Ridge. It is the highest point in the area and is oriented in a northeast-southwest direction. Mount Airy's Main Street is built on top of this structure. Parrs Ridge is

composed of harder, less weatherable mineralogy than the adjacent areas east and west of it and is a major hydrogeologic boundary in this area (R. E. Wright, 1988).

The Mount Airy area is underlain by the Ijamsville Formation and the Marsburg Schist. These two formations are intermingled in this area and are considered as one aquifer. The Ijamsville Formation consists chiefly of blue-green phyllite, which is slaty in places. The Marburg is bluish-gray to green fine-grained schist containing mica, chlorite, quartz and either albite or otterite (Meyer and Beall, 1958). Weathering of the phyllite and schist results in clayey overburden material known as saprolite, below which is fractured bedrock. Saprolite thickness ranges from 0 feet in ridge to upto 100 feet in the valleys. In this type of aquifer, most of the ground water is stored in the saprolite and ground water flow is through fractures in the rock. In rock types like phyllite and schist, fractures form along planes of foliation and mineral layering (Nutter and Otton, 1969). The aquifer is considered to be unconfined.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment area for the system. WHPAs were delineated for Well Nos. 1 through 7 by the Carroll County Bureau of Water Resource Management as part of the County Water Resources Ordinance development (R.E Wright, 1989). The WSP delineated the WHPA for Well No. 8. Hydrogeologic mapping was the method used for the delineation. This is the methodology recommended for fractured rock aquifers in the EPA approved Maryland's Source Water Assessment Plan (1999).

Mount Airy's WHPA consists of five smaller WHPAs (figure 2). These WHPAs are based on the five watersheds in which the wells are located. Well Nos. 1-4 are all located in one watershed, the Woodville Branch, and therefore have one delineated WHPA. The other wells (5 - 8) are located in different watersheds and each have individual WHPAs.

The WHPA delineated represents the recharge area for the Town's water supply. The boundaries of the WHPA are base on ground water flow direction and ground water divides inferred from topography and ground water discharge areas, changes in formation type, permitted withdrawal rates, linear features (fracture traces) and a calculated downgradient zone of contribution using the average annual withdrawal rate (The Town of Mount Airy Ordinance No. 1997-6). The total area of Mount Airy's WHPA is 2339 acres.

POTENTIAL SOURCES OF CONTAMINATION

For this assessment MDE Waste and Water Management databases and Carroll County's database were reviewed, staff consulted, and field inspections conducted, to identify potential sources of contamination in and around the Mount Airy WHPA. In addition, MDE staff conducted a follow up field survey of the WHPA on March 16, 2000 and also briefly met with Mr. Randy Driver, the Water Operator for Mount Airy, to

discuss water quality concerns. Mr. Driver indicated that nitrate levels in the water supply were his biggest concern.

Several commercial establishments that have Underground Storage Tanks (USTs), or are classified as Controlled Hazardous Substance Generators (CHS) or are Pesticide Dealers (PD) are identified on Figure 2. Table 2 lists the facilities identified and their potential sources of contaminants. This is based on generalized categories and often the potential contaminant depends on the specific chemicals and processes being used at the facility. The potential contaminants are not limited to those listed. Potential contaminants are grouped as Volatile Organic Compounds (VOC), Synthetic Organic Compounds (SOC), Inorganic Compounds (IOC) and Heavy Metals (HM).

ID	TYPE	SITE NAME	ADDRESS	POTENTIAL CONTAMINANT
1	UST	Van Sant Plumbing & Heating	3 N Church St.	VOC
2	UST	WRF Enterprises, Inc	15 N Main St	VOC
3	UST	WRF Plumbing & Heating	4 Prospect Rd	VOC
4	UST	Mt. Airy Auto Parts, Inc	407 S Main St	VOC
5	UST	GVE Building	1 Park Ave	VOC
6	UST	Economy/Weil & Griffith	Center St	VOC
7	UST/PD	Southern States	Center St & Lookout Ave	VOC, SOC, IOC
8	UST	Michael Berman Enterprises	Park Ave	VOC
9	UST	Mt. Airy CDO	1305 S Main St	VOC
10	UST	Twin Ridge Elementary	1106 Leafy Hollow	VOC
11	UST	Mt Airy Mobil	S Main St & Ridgeville Rd	VOC
12	UST	Ridgville Gas	4 Ridgeville Rd	VOC
13	CHS	Precision Auto Body	300 Main St	VOC, HM
14	CHS	DMS Sign Connection Inc	102 Lookout Ave	HM, VOC
15	CHS	C & P Telephone Substation	819 S Main St	SOC
16	CHS	Mt Airy Cleaners	1502 S Main St	VOC
17	CHS	Courtney Radiators	9 W Ridgeville Rd	HM, VOC
18	PD	Myers Liquid Fertilizer	Rising Ridge Rd	SOC, IOC
19	UST	Four County Exxon	Route 27 & I-70	VOC

Table 2. Potential Contaminant Point Sources within the Mount Airy WHPA (see figure 2 for locations).

A few of the listed facilities (3, 4, and 6) have had their tanks removed and replaced due to leaks, following investigation by MDE's Oil Control Program. These sites are now in compliance with State regulations with no reported contamination problems. A stormwater infiltration pond is located in the vicinity of Well No.7 (figure 1). The stormwater pond drains the parking lot of the Twin Ridge Center that has a number of automobile related facilities, which may be potential sources of heavy metals and VOCs. A field investigation of commercial establishments in the area indicated no illegal ground water discharges in the WHPA.

Based on the Maryland Office of Planning's 1997 Land Use Map, the land use within the Mount Airy WHPA are as shown in table 3. As noted in table 3 the largest land use category is cropland (39%), followed by medium density residential (21.2%) and forest (17%). Figure 3 shows the distribution of the land use in and around the WHPA. Some of the land use has changed since the publication of the 1997 Land Use Map especially in the vicinity of Well No. 7.

LAND USE	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	258	11.0
Medium Density Residential	495	21.2
High Density Residential	57	2.4
Commercial	57	7.9
Cropland	916	39.2
Pasture	24	1.0
Forest	405	17.3

Table 3. Land Use Summary for the Mount Airy WHPA.

Based on the combination of the Maryland Office of Planning's Frederick (1996), and Carroll (1995) County Sewer maps, the Sewer Service Area Categories are shown in table 4. Figure 4 shows the distribution of the Sewer Service Areas in and around the Mount Airy WHPA. The majority of the residential land and commercial land within the Mount Airy WHPA are sewered or in planned service areas.

SEWER SERVICE AREA	TOTAL AREA (acres)	PERCENTAGE OF TOTAL WHPA
No Planned Service	881	37.6
Existing Service	811	34.7
Service Within 3 years	381	16.3
Service Within 4 to 6 years	73	3.1
Service Within 7 to 20 years	193	8.3

Table 4. Sewer Service Area Summary for the Mount Airy WHPA.

Non-point sources of contamination are usually associated with land use activities in the area. Application of fertilizers and pesticides on cropland could result in potential sources of nitrate and SOC. Lawn maintenance and landscaping activities on residential and commercial land could also be potential sources of nitrate and SOC. Onsite septic systems in areas that have no sewer service may be potential sources of nitrate and microbial pathogens. In addition, wastes from livestock are potential sources of nitrate and microbial pathogens in ground water.

WATER QUALITY

Water Quality data was reviewed from the Water Supply Program's database and system files for Safe Drinking Water Act contaminants. The data described is from finished and raw water. The treatment currently in use in Mount Airy is chlorination for disinfection, pH adjustment for corrosion control, and fluoridation. In addition, ion exchange is used for nitrate removal in Well No. 8.

In accordance with Maryland's SWAP, data from the water sources and treatment plants was compared with the Maximum Contaminant Levels (MCLs). If the monitoring data is greater than 50% of a MCL, the written assessment will describe the sources of such a contaminant and, if possible, locate the specific sources which are the cause of the elevated contaminant level. A review of the monitoring data since 1993 for Mount Airy's finished water indicates that the system's water supply meets drinking water standards. Nitrate and tetrachlorethene were the contaminants that were detected above 50% of the MCL. In addition, radon-222 was also detected above 50% of the proposed MCL. These are discussed in more detail below.

Inorganic Compounds (IOCs)

The only IOC detected above 50% of the MCL was nitrate. The MCL for nitrate is 10 ppm. The nitrate detections above 50% of the MCL in Mount Airy's water supply are shown in Tables 5a, 5b and 5c. A raw water sample from Well No. 8 (8/21/96) had a nitrate detection of 10.4 ppm. The Water Supply Program required the Town to install nitrate removal treatment for this well prior to approving it as a production well.

CONTAM ID	CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1040	NITRATE	10	18-Feb-93	5.2
1040	NITRATE	10	20-Sep-93	5.62
1040	NITRATE	10	10-May-94	6.54
1040	NITRATE	10	17-Nov-94	6.16
1040	NITRATE	10	30-Jan-95	5.7
1040	NITRATE	10	08-Feb-95	5.97
1040	NITRATE	10	16-May-95	5.42
1040	NITRATE	10	18-May-95	7.06
1040	NITRATE	10	22-Nov-95	5.56
1040	NITRATE	10	15-Aug-96	7
1040	NITRATE	10	07-Feb-97	6.47
1040	NITRATE	10	07-Apr-97	8.52
1040	NITRATE	10	12-May-98	6.61

Table 5a. IOC results above 50% of the MCL for Mount Airy Plant 1 (Wells 1 -4) finished water since 1993.

CONTAM. ID	CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1040	NITRATE	10	18-Feb-93	9.7
1040	NITRATE	10	20-May-93	5.7
1040	NITRATE	10	20-Sep-93	6.1
1040	NITRATE	10	10-Jan-94	6.17
1040	NITRATE	10	07-Jul-94	10
1040	NITRATE	10	16-Aug-94	5.86
1040	NITRATE	10	17-Aug-94	9
1040	NITRATE	10	18-Aug-94	7.02
1040	NITRATE	10	17-Nov-94	9.9
1040	NITRATE	10	19-Sep-95	8
1040	NITRATE	10	22-Nov-95	5.13
1040	NITRATE	10	21-May-96	5.14
1040	NITRATE	10	12-Jul-96	7.1
1040	NITRATE	10	15-Aug-96	7.25
1040	NITRATE	10	07-Feb-97	9.4
1040	NITRATE	10	07-Apr-97	8.03
1040	NITRATE	10	10-Sep-97	8.04
1040	NITRATE	10	15-Oct-97	7.6
1040	NITRATE	10	03-Feb-98	7.85
1040	NITRATE	10	07-Jul-98	6.91
1040	NITRATE	10	05-Oct-98	9.27
1040	NITRATE	10	17-Nov-98	7.4
1040	NITRATE	10	12-Jan-99	7.6
1040	NITRATE	10	15-Apr-99	7.6
1040	NITRATE	10	21-Jul-99	7.8
1040	NITRATE	10	07-Dec-99	7.3

Table 5b. IOC results above 50% of the MCL for Mount Airy Plant 2 (Wells 5 and 6) finished water since 1993.

CONTAM ID	CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1040	NI TRATE	10	13-Dec-93	8.8
1040	NITRATE	10	30-Jan-95	5.7
1040	NITRATE	10	21-Aug-95	7.5
1040	NITRATE	10	21-May-96	6.84
1040	NITRATE	10	15-Aug-96	5.37
1040	NITRATE	10	07-Feb-97	8.53
1040	NITRATE	10	07-Apr-97	6.61
1040	NITRATE	10	10-Sep-97	8.17
1040	NITRATE	10	15-Oct-97	7.4
1040	NITRATE	10	03-Feb-98	6.51
1040	NITRATE	10	07-Apr-98	9.4
1040	NITRATE	10	07-Jul-98	5.83
1040	NITRATE	10	05-Oct-98	9.28
1040	NITRATE	10	17-Nov-98	7.9
1040	NITRATE	10	12-Jan-99	7.9
1040	NITRATE	10	15-Apr-99	5.1
1040	NITRATE	10	21-Jul-99	8.7
1040	NITRATE	10	07-Dec-99	7.9

Table 5c. IOC results above 50% of the MCL for Mount Airy Plant 3 (Well 7) finished water since 1993.

Volatile Organic Compounds (VOCs)

The only VOC detected above 50% of the MCL was tetrachloroethene (table 6). The MCL for tetrachloroethene is 5 ppb. Tetrachloroethene was detected in Well No. 5 above the MCL in 1993. The history of tetrachloroethene levels measured at plant 2 (a combination of Well Nos. 5 and 6) is shown in tables 6a and 6b.

The only other VOC detected was ethylbenzene at 0.6 ppb on 7/5/96 at Plant 2 (Wells 5& 6). Ethylbenzene has an MCL of 700 ppb.

CONTAM ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
2987	TETRACHLOROETHENE	5	31-Oct-90	<0.5
2987	TETRACHLOROETHENE	5	17-Aug-95	<0.5
2987	TETRACHLOROETHENE	5	04-Mar-96	9
2987	TETRACHLOROETHENE	5	12-Jul-96	<0.5
2987	TETRACHLOROETHENE	5	02-Mar-99	<0.5
Note: A sample from the school located adjacent to Well Nos. 5 & 6 was measured to have 1.5 ppb of Tetrachloroethene in September 1998				

Table 6a. Tetrachloroethene results for Well Nos. 5 & 6 combined since 1990.

CONTAM ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
2987	TETRACHLOROETHENE	5	10-Feb-89	1.4
2987	TETRACHLOROETHENE	5	11-Jun-93	12.5
2987	TETRACHLOROETHENE	5	07-Jul-94	1.0

Table 6b. Tetrachloroethene results for Well No. 5 since 1989.

Synthetic Organic Compounds (SOCs)

Di(2-ethylhexyl) phthalate was detected several times in the water supply at levels ranging from) 0.53 ppb to 6.2 ppb. The MCL for this SOC is 6 ppb. A review of these results indicated that phthalate was found in the laboratory blanks and therefore these results are not interpreted to represent actual water quality.

Alachlor was detected at Plant 2 on 3/8/99 at 0.5 ppb and at Plant 3 on 4/26/99 at 0.9 ppb. The MCL for alachlor is 6 ppb.

Metolachlor was detected at Plant 2 on 3/8/ 99 and 4/26/99 at 2.5 ppb and 0.6 ppb respectively. It was also detected at Plant 3 on 3/8/99 and 4/26/99 at 0.5 ppb and 3.8 ppb respectively. Melolachlor is an unregulated SOC and does not have an MCL, but has a health advisory of 70 ppb.

Radionuclides

Currently, there is no MCL for radon-222. EPA has proposed an MCL of 300 picoCuries per liter (pCi/L) and an alternate MCL of 4000 pCi/L. The detections of radon-222 in Mount Airy's water supply at 50% of the proposed MCLs are shown in Table 7. In addition, radon-222 was also detected at 55 pCi/L in Plant 2 (Wells 5 & 6). No sampling data was available for Plant 4 (Well 8).

PLANT ID	CONTAM ID	CONTAMINANT NAME	PROPOSED MCL(pCi/L)	SAMPLE DATE	RESULT (pCi/L)
01	4004	RADON-222	300 or 4000	04-Mar-96	3420
03	4004	RADON-222	300 or 4000	04-Mar-96	6580

Table 7. Radon-222 results above 50% of the proposed MCL for Mount Airy Plant1 (Wells 1-4) and Plant 3 (Well 7) finished water since 1993.

Microbiological Contaminants

Raw water samples were collected and tested for bacteria from Well Nos. 1, 2, 4, 5 and 6 on 10/12/98 following 2 inches of rainfall, to determine whether these sources are ground water under the influence of surface water (GWUDI). The results were negative for the presence of total and fecal coliform for all these wells except for Well No. 2, which had a total coliform count of 4.6 colonies/100 ml and fecal coliform count of 2.6 colonies/100 ml. Well 2 was resampled on 3/28/00 after 0.9 inches of rainfall and was negative for fecal coliform, but 23 colonies/100 ml of total coliform were present. Raw water samples were collected from Well Nos. 7 and 8 on 2/27/00 following 0.75 inches of rainfall and tested for bacteria. Well No. 8 tested negative for total and fecal coliform. Well No. 7 had a total coliform count of 4 colonies /100 ml but no fecal coliform was present.

SUSCEPTIBILITY ANALYSIS

Mount Airy's wells obtain water from an unconfined aquifer. In general, water supplies in unconfined aquifers are susceptible to contamination from land use activities. In addition, all of Mount Airy's wells are located downgradient of Main Street where most of the commercial activity is clustered. Therefore, continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. The criteria that was used to conduct the susceptibility analysis is as follows: (1) available water quality data, (2) presence of potential contaminant sources in the WHPA, (3) aquifer characteristics, (4) well integrity and the (5) likelihood of change to the natural conditions.

Inorganic Compounds (IOCs)

Nitrate has been detected in Mount Airy's water supply above 50% of the MCL in all the wells (tables 5a, 5b, 5c). A review of the sampling data does not show any trends in the nitrate concentrations, only minor fluctuations in levels. Sources of nitrate can be generally traced to land use. Fertilization of cropland and residential properties are non-point sources of nitrate in ground water. Onsite septic systems are also sources of nitrate in ground water. Cropland and residential land make up 39% and 37% of the WHPA (table 3). Four of the wells (Nos. 5, 6 and 7, and 8 are located in cropland areas and nitrate levels have exceeded the MCL in Well Nos. 6 (in 1992) and 8 (in 1996). Cover crops have been planted on a farm located in the WHPA adjacent to Well No. 6, and

nitrate levels have fallen below the MCL in that well's supply. Two dairy farms are located within the WHPA for Well No. 8. The Town has installed nitrate removal treatment for this well to meet the MCL for nitrate.

Based on the above analysis, Mount Airy's water supply is susceptible to nitrate contamination.

Volatile Organic Compounds (VOCs)

Tetrachloroethene, a solvent used for dry cleaning and degreasing metals, has been detected above the MCL two times in Well No. 5. An investigation indicated that there was a dry cleaning laundry in an apartment building near the well may have been the source of this contaminant. The Town indicated the source of the tetrachloroethene may have been a cabinet maker located at that building prior to its conversion to an apartment. Ethylbenzene, a component of gasoline and used for making resin, was detected in Plant 2 (Wells 5 & 6) finished water. There are several USTs and CHS generators, which are potential sources of VOC contamination, located upgradient of all the wells (figure 2). In addition, several facilities had their USTs removed and replaced due to leaks and noncompliance with the State regulations.

Based on the above analysis, Mount Airy's water supply (except for Well No. 8) is susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

Alachlor and metolachlor were detected in Well Nos. 5, 6 and 7. The alachlor detections were below MCL. Metolachlor is an unregulated SOC and does not have an MCL. Alachlor and metolachlor are herbicides and may have been used in the cropland areas where these wells are located (figure 2). In addition, potential sources of SOC contamination are present upgradient of these wells. A large portion of the WHPA for Well Nos. 1- 4 is residential land where pesticide application on these areas could be potential sources of SOC contamination. Well No. 8 is located and surrounded by cropland, where application of pesticides could be potential sources of SOC contamination.

Based on the above analysis Mount Airy's water supply is susceptible to SOC contamination.

Radionuclides

Radon-222 was detected in the finished water for Wells Nos. 1-4 and Well No.7 at levels above 50% of the proposed MCL for radon. It was also detected at a lower level in the finished water for Well Nos. 5 & 6. No sampling data was available for Well No.8. The source of radon in ground water can be traced to the natural occurrence of uranium in rocks. Radon is prevalent in ground water throughout the Piedmont region of Maryland due to radioactive decay of uranium bearing minerals in the bedrock (Bolton, 1996).

Mount Airy's water supply is susceptible to radon due to the natural occurrence of this contaminant in aquifer material.

Microbiological Contaminants

Raw water bacteriological testing of Mount Airy's wells after rainfall indicates that wells are **not** susceptible to protozoans. The presence of total coliform in Well Nos. 2 and 7 indicate that these wells **are** susceptible to viruses. Viruses are much smaller, can survive longer, and may not be effectively filtered out by the aquifer as protozoans and bacteria. Additional sampling for specific viral indicators will be needed to evaluate the other wells.

MANAGEMENT OF THE WHPA

Ordinance

- The Town of Mount Airy officials have already taken a key step in protecting their drinking water supply by adopting a comprehensive Wellhead Protection Ordinance (No. 1997-6) on January 5, 1998.
- The Town needs to work with Frederick and Carroll Counties to convince them to adopt similar regulations for areas of the Mount Airy WHPA that are in their respective counties to provide consist protection to the water supply.

Public Awareness and Outreach

- Pamphlets, flyers and bill stuffers sent to local residents, businesses and farmers will help educate the general public about Wellhead Protection.
- Placing signs at the WHPA boundaries is a good way to make the public aware of protecting their source of water supply.

Planning/New Development

- As stated in the Ordinance (No. 1997-6), the Town should ensure that all new development in the WHPA be reviewed by the Town Engineer for compliance with this Ordinance.
- Developers and new businesses planning to move into Mount Airy should be made aware of the Ordinance and the Town's water supply protection measures.

Cooperative Efforts with Other Agencies

- Request the assistance of the University of Maryland Agricultural Extension Service, the Soil Conservation Service to work with the farmers to adopt Best Management Practices (BMP's) for farms located within the WHPA.
- The farmers can also participate in the New Conservation Reserve Program (CREP) applicable to the cropland located within the WHPA. Government funding is available to qualified farmers equal to the cost and financial benefit of farming the

area. The Natural Resources Conservation Service is responsible for determining the relative environmental benefits of each acre offered for participation.

Monitoring

- Continue quarterly nitrate sampling and note any increase in concentrations of nitrate. If levels in Plants 1, 2 and 3 reach the MCL treatment for nitrate removal will have to be considered.
- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.

Land Acquisition/Easements

- The availability of loans for purchase of and/or easements for the purpose of protecting the water supplies is available from MDE. Loans are currently being offered at zero percent interest and zero points.

Contingency Plan

- COMAR 26.04.01.22 regulations require all community water systems to prepare and submit for approval a plan for providing a safe and adequate drinking water supply under emergency conditions.

Changes in Use

- Any increase in pumpage or addition of new wells to the system may require revision of the WHPA. The system is required to contact the Water Supply Program when an increase pumpage is applied for or when new wells are being considered.

Contaminant Source Inventory/Well Inspection

- The Town should review the potential sources of contaminants within the WHPa and update them if necessary
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.

REFERENCES

- Bolton, David W., 1996, Network Description and Initial Water-Quality Data from a Statewide Ground-Water Quality Network in Maryland: Maryland Geological Survey Report of Investigations No. 60, 167 p.
- Maryland Department of the Environment, Water Supply Program, 199, Maryland's Source Water Assessment Plan, 36 p.
- Meyer, G., and Beall, R. M., 1958, The Water Resources of Carroll and Frederick Counties: Department of Geology, Mines and Water Resources Bulletin 22, 355p.
- Nutter, L. J., and Otton, E. G., 1969, Ground-Water Occurrence in the Maryland Piedmont: Maryland Geological Survey Report of Investigations No. 10, 56 p.
- R. E. Wright Associates, Inc., 1988, Phase II Report Carroll County Water Resources Study Volumes I and II.
- R. E. Wright Associates, Inc., 1989, Recommended Water Resource Management Standards, Criteria, and Administrative Procedures.
- The Town of Mount Airy Ordinance No. 1997-6, 1998, 15 p.
- U.S. Environmental Protection Agency, 1991, Delineation of Wellhead Protection Areas in Fractured Rocks: Office of Water and Drinking Water, EPA/570/9-91-009, 144 p.

OTHER SOURCES OF DATA

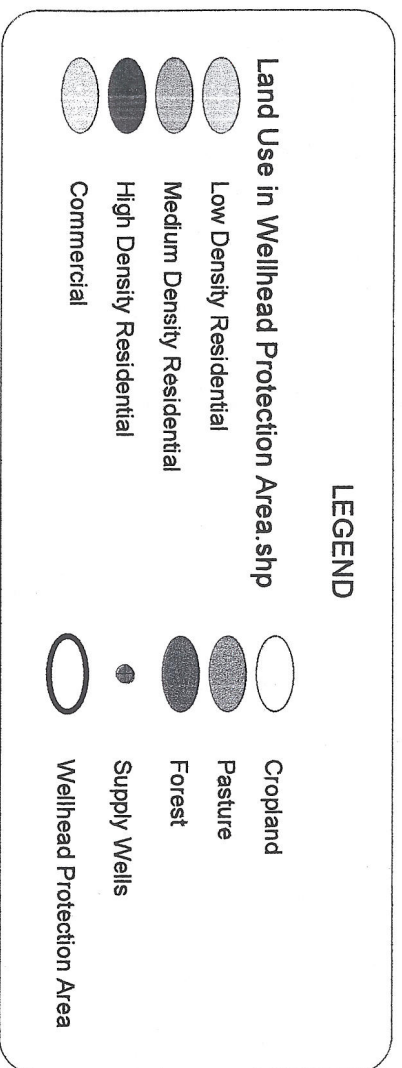
Water Appropriation and Use Permits: CL1987G076, FR1976G007, FR1995G020
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Carroll County WHP Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles: Damascus
NE and Liberytown SE
USGS Topographic 7.5 Minute Quadrangle: Walkersville and Winfield
Maryland Office of Planning 1997 County Land Use Maps: Carroll, Frederick, Howard
and Montgomery
Maryland Office of Planning County Sewer Maps: Carroll (1995), Frederick (1996),
Howard (1994) and Montgomery (1995)

FIGURES
(found in pocket)





Figure 3. Land Use Map of the Mount Airy Wellhead Protection Area



Source: Maryland Office of Planning 1997 Land Use Maps for Carroll, Frederick, Howard and Montgomery Counties



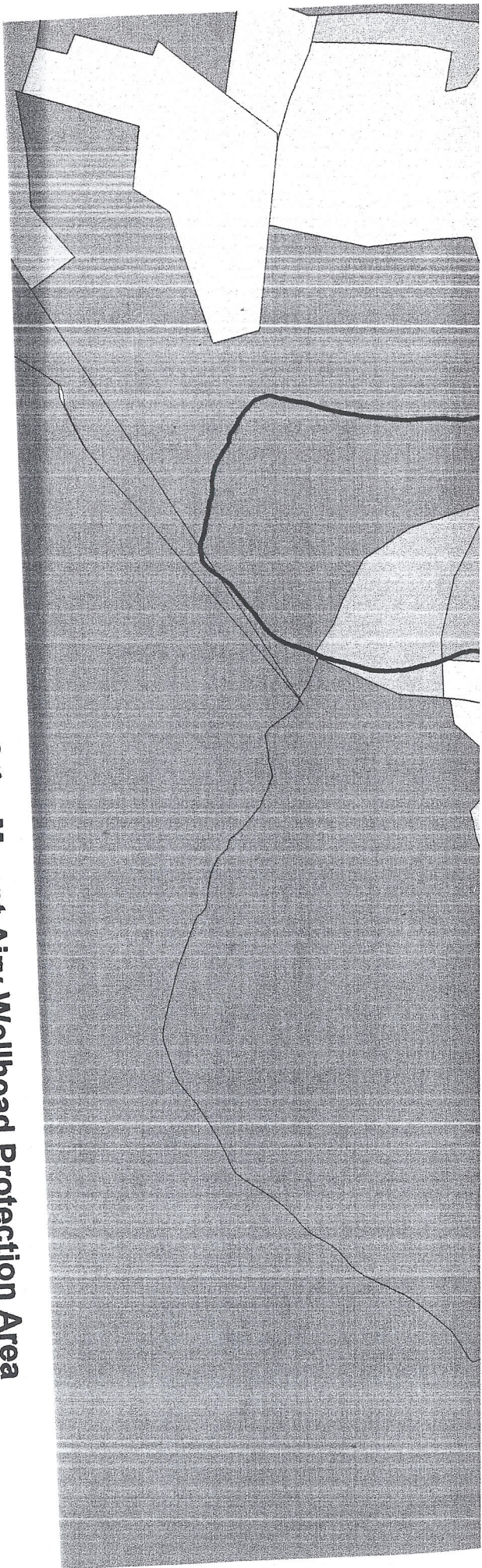
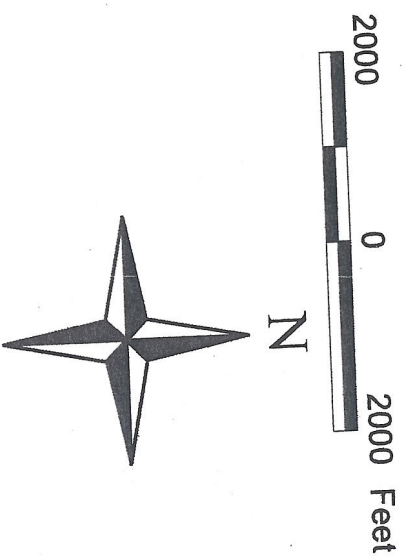
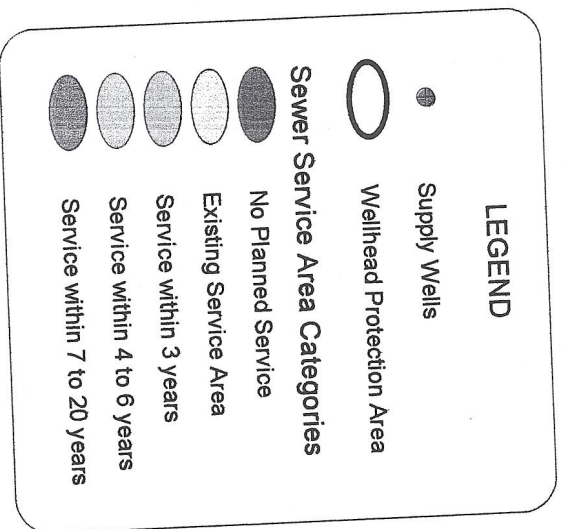


Figure 4. Sewer Service Area Map of the Mount Airy Wellhead Protection Area



Source: Maryland Office of Planning County Sewer Maps - Carroll (1995), Frederick (1996), Howard (1994) and Montgomery (1995)

WELL 8

WELL 2

WELL 4

WELL 3

WELL 1

WELL 5

WELL 6



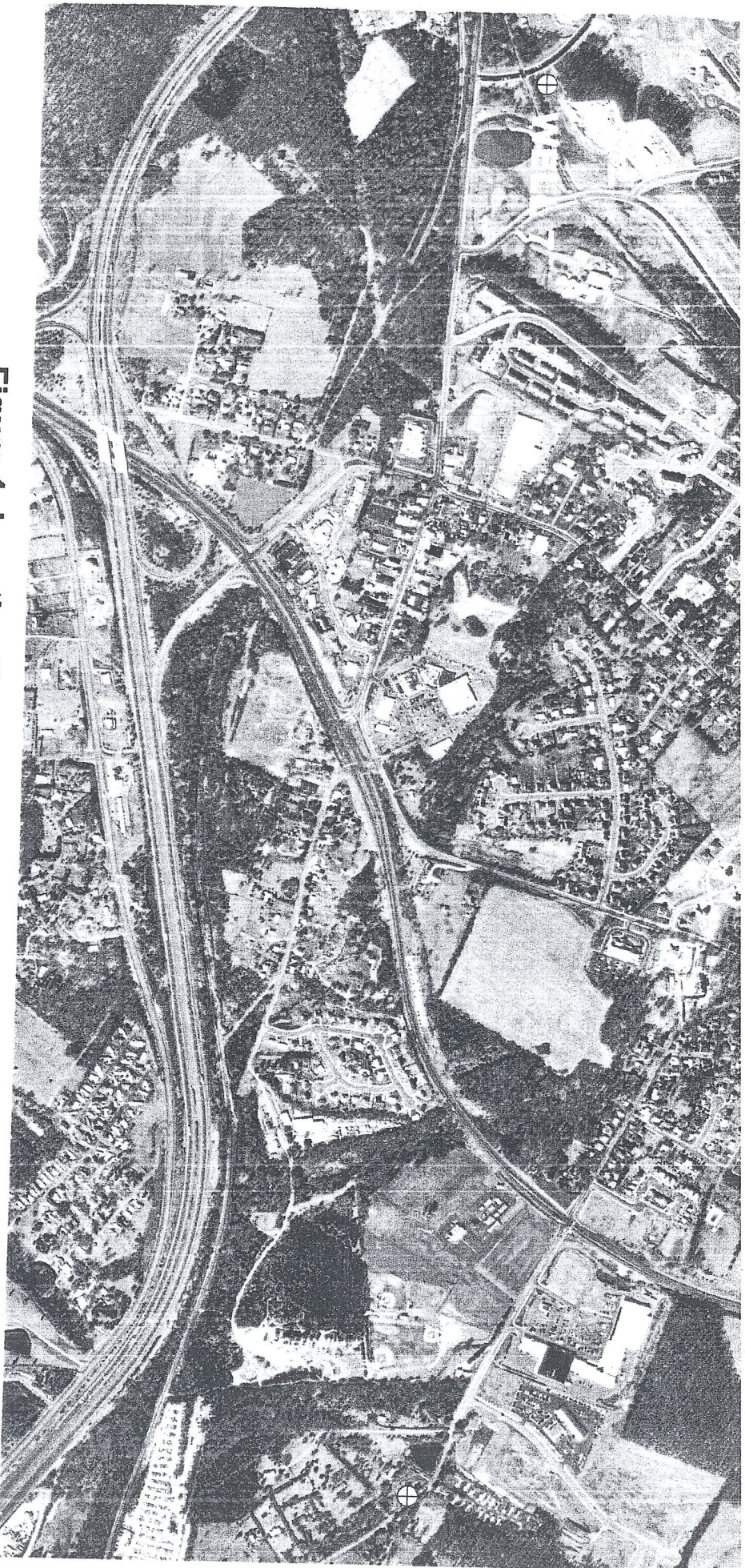
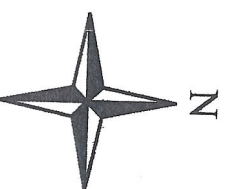
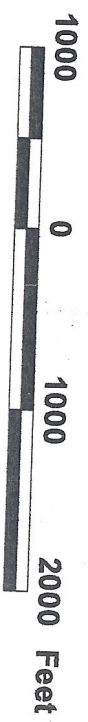
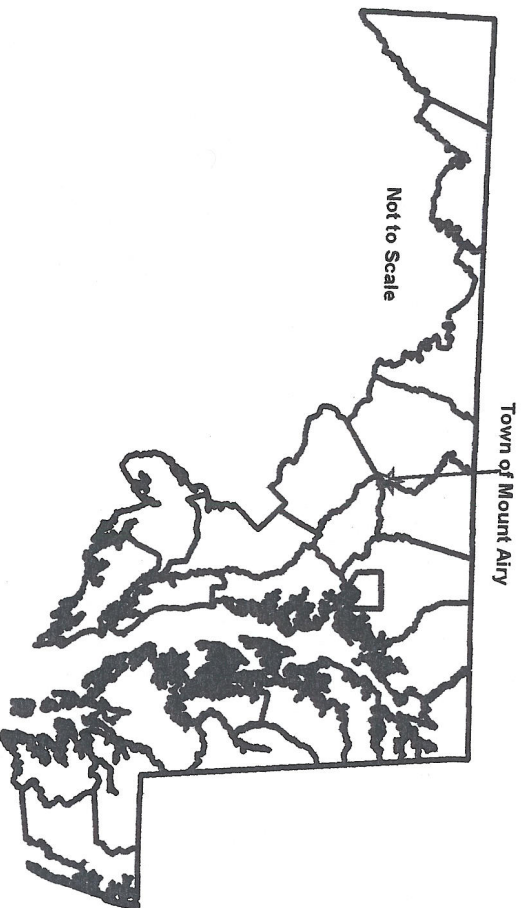


Figure 1. Location Map for Town of Mount Airy's Wells



Source: DNR DOQs Damascus NE
and Libertytown SE 4-3-95



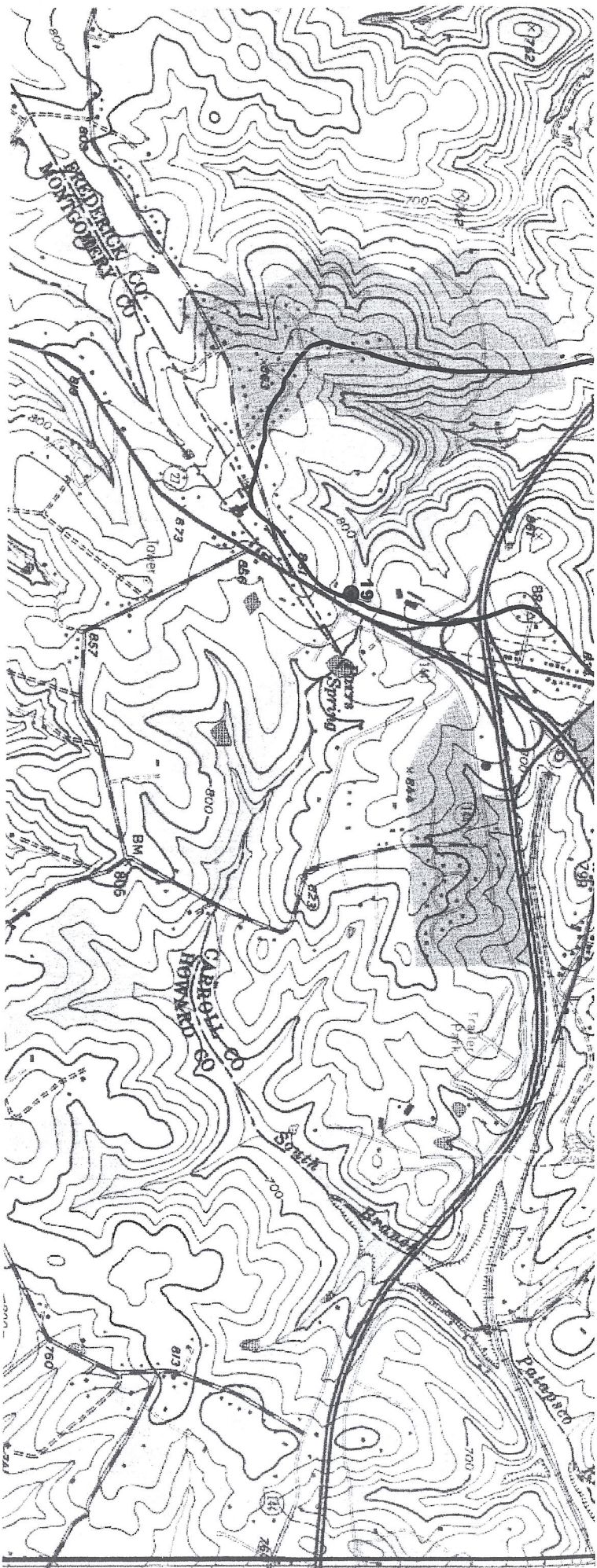
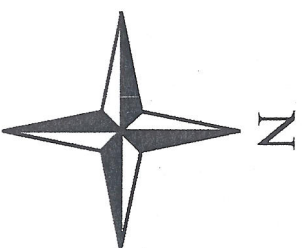
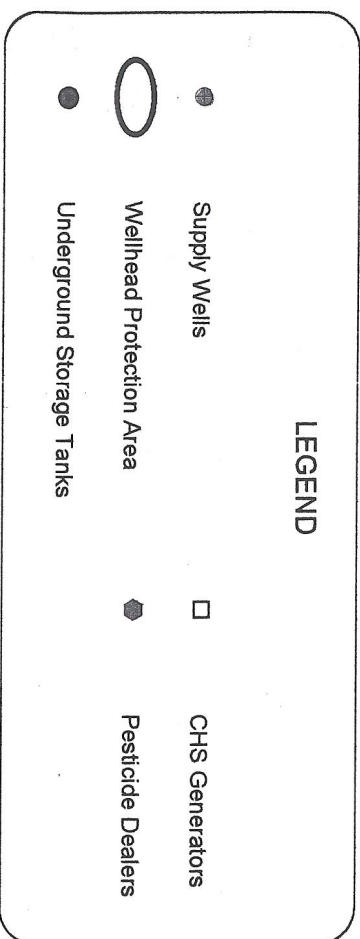


Figure 2. Mount Airy Wellhead Protection Area with Potential Contaminant Sites



Base Map: USGS Topographic 7.5 Minute Quadrangles - Walkersville and Winfield